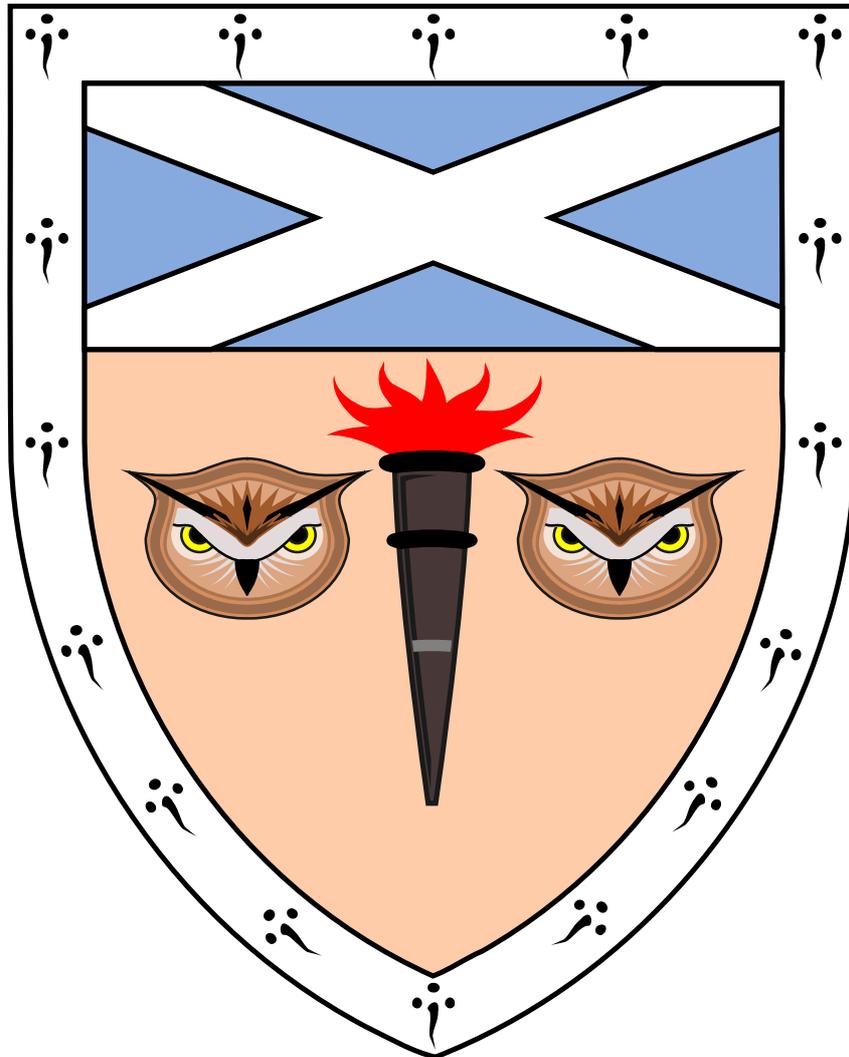


The Royal Scottish Society of Arts

Showcasing Scotland's Science, Technology and Innovation

196th Session

2016-2017



Patron: Her Majesty the Queen

Established 1821 - Incorporated by Royal Charter 1841

Registered Scottish Charity SC015549

The Royal Scottish Society of Arts

Showcasing Scotland's Science, Technology and Innovation

The Royal Scottish Society of Arts was founded in 1821 as 'The Society for the Encouragement of the Useful Arts in Scotland' and incorporated by Royal Charter in 1841. It was concerned with the fields that we would now describe as science, technology, engineering and manufacture, but which were then known as the useful arts, as opposed to the fine arts.

Today the Society aims to showcase Scotland's Science, Technology and Innovation, mainly through a monthly lecture programme, excursions, promotion of Honorary Fellows, and the award of medals.

The lecture programme is given by excellent public speakers, who are distinguished in their fields of study, and the topics cover a wide range of scientific and technical issues, all pertinent to the Scotland in which we live today.

Fellowship of the Society is open to all with an interest in science and its place in society who would like to attend our meetings. Fellows of the Society are entitled to use the letters FRSSA after their names. Applications for Fellowship must be supported by at least one Fellow of the Society to whom the applicant is personally known.

More information about applying for Fellowship is available at our meetings. Please introduce yourself to the President, Secretary or one of the members of the Society's Council at a meeting for further details.

Professor Stuart Munro
president@rssa.org.uk

Dr Jane Ridder-Patrick
secretary@rssa.org.uk
29 East London Street
Edinburgh EH7 4BN

Mr Graham Rule
treasurer@rssa.org.uk

Honorary Fellows

The Society's Rules allow for the election of up to 10 people "*Distinguished in the Science of the Applied Arts*" as Honorary Fellows. Current Honorary Fellows are:

Professor John Brown FRSE, Astronomer Royal for Scotland
Professor Peter Higgs CH BSc MSc PhD FInstP FRSE FRS
Sir Thomas Dalrymple Loch Bt
Professor Anne Glover CBE FRSE FASM
Professor Malcolm Longair CBE FRS FRSE
Professor Stephen Salter MBE FRSE
Professor Heinz Wolff FIEE FIBES FRCP(Hon) FRSA

The shield shown on the front page is from the Society's full 'coat of arms' as described by the Lord Lyon King of Arms: "Or, between two eagle owls heads affrontée proper a torch Sable paleways enflamed Gules, on a chief Azure a saltire Argent, all within a bordure Ermine". The shield has a white border with black marks representing ermine fur. The upper part has a white (or silver) diagonal cross on a blue background. Below that the main body of the shield is yellow (or gold) with two forward-facing eagle owl heads on either side of an upright black torch with red flames. The Society has recently commissioned the local illustrator Sandy Mackenzie <sandiloquent@gmail.com> to create the computer file based on the description and original painting from the Lord Lyon.

The Big Data Revolution

Professor Richard Kenway

OBE FRSE FInstP FLSW

**Tait Professor of Mathematical Physics
University of Edinburgh**

In the Augustine United Church

41 George IV Bridge

Edinburgh, EH1 1EL

On Monday 26th September 2016.



Advances in computing technology are driving new ways of doing science. In our lifetimes, we've seen computational science mature, as parallel computing has led to supercomputers powerful enough to simulate physical systems. Today, the explosion of digital data that record all aspects of our environment and behaviour is building an enormous accessible resource for business and research. Will this so-called Big Data generate new knowledge and revolutionise our lives, or is it just marketing hype?

Professor Kenway's research explores theories of elementary particles using computer simulation. As a Vice-Principal, he is responsible for the University's provision of UK high-performance computing services and for promoting advanced computing technologies, computational and data science to benefit academia and industry. In the Queen's 2008 Birthday Honours, he was awarded an OBE for services to science. He established and chaired the Scientific Steering Committee of the Partnership for Advanced Computing in Europe, is a founder member of the UK e-Infrastructure Leadership Council and is a Trustee of the Alan Turing Institute.

The Big Squeeze - Putting Materials Under Pressure



Professor Colin R Pulham
Professor of High-Pressure Chemistry and
Head of School of Chemistry
The University of Edinburgh
and

Dr Jenny Bos
School of Chemistry
The University of Edinburgh

In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 31st October 2016.

This demonstration lecture will highlight the research being conducted in Edinburgh and in other institutions into the effects of very high pressures (up to a million times greater than at the surface of the Earth) on a range of materials. At these pressures, oxygen forms beautiful red crystals and eventually becomes metallic; new forms of ice are produced that melt above 100°C; and graphite turns into diamond. Find out how high pressures can be used in the processing of foods such as fruit juices and shellfish to make them safer to eat, and how we can improve our understanding of explosives. Join us on this voyage to explore the weird and wonderful world of high pressure!

Dr Jenny Bos studied Chemistry at the University of Aberdeen and at the University of Oxford. Her interest in public engagement continued during her post-doctoral research at the Centre for Science at Extreme Conditions, University of Edinburgh. She coordinated a public engagement project called 'The Big Squeeze'. Highlights included presenting at the Edinburgh International Science Festival, Times Cheltenham Science Festival, STV's The Hour show and at the Russian Festival of Science. In 2011 Jenny joined the Royal Society of Chemistry as the Education Coordinator for Scotland where, along with supporting teachers in Scotland, she also promoted chemistry to schools and the general public across the country. In 2012 she was appointed to the role of Public Engagement and Outreach Coordinator for the School of Chemistry, University of Edinburgh.

Prof. Colin Pulham holds a personal chair in High-Pressure Chemistry at the University of Edinburgh, is a member of the Centre for Science at Extreme Conditions (CSEC) at Edinburgh, and is currently Head of the School of Chemistry. His research interests include the study of crystallisation processes under a wide range of conditions, with particular interests in the effects of high pressure on molecular compounds such as pharmaceuticals, energetic materials (explosives, propellants), and fuels. He is also studying the use of heat-storage materials for domestic and industrial applications. Colin has a longstanding interest in public engagement and has been awarded several prizes including the Royal Society Kohn Award for Excellence in Engaging the Public with Science.

Quantum Inspired Imaging with Single-Pixels

Professor Miles Padgett
Vice-Principal for Research
The University of Glasgow

In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 28th November 2016.



Cameras are often marketed in terms of the number of pixels they possess - “the more pixels the “better” the camera. Rather than increasing the number of pixels we ask the question “how can a camera work with a single pixel?”. This talk will link the field of computational ghost imaging to that of single-pixel cameras explaining how spatial structuring of either the illumination or imaging system means that image and video reconstruction can be achieved using just a small number of photodiodes.

Miles Padgett holds the Kelvin Chair of Natural Philosophy at the University of Glasgow. He leads QuantIC, a quantum imaging centre and one of four Quantum Technology hubs in the UK. In 2001 he was elected a Fellow of the Royal Society of Edinburgh (RSE) and in 2014 a Fellow of the Royal Society, the UK's National Academy. In 2009, with Les Allen, he won the Institute of Physics Young Medal, in 2014 the RSE Kelvin Medal and in 2015 the Science of Light Prize from the European Physical Society.

Livestock Matters for Global Food Security

Professor Julie Fitzpatrick OBE
Scientific Director & Chief Executive
Moredun Research Institute

In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 30th January 2017.



It is estimated that there will be 9 billion people living on earth by 2050. This will require significantly increased quantities of safe, affordable and sustainable food for all. Livestock species play an important role in Scotland and across the world in terms of food supply, impact on the environment, and support of rural and urban communities. Multiple infectious diseases are a major constraint for livestock and their owners, and Scotland's scientists play a leading role in developing disease prevention programmes, including novel vaccines. New technologies, combined with targeted knowledge exchange activities, will underpin future livestock production relying less on the use of anti-microbial drugs and more on the ethos of "prevention being better than cure".

Julie Fitzpatrick, originally qualifying as a vet from the University of Glasgow in 1987, is the Scientific Director of the Moredun Research Institute and Chief Executive of the Moredun Group. She also holds a Chair in Food Security in the College of Medical, Veterinary and Life Sciences at the University of Glasgow. Julie's research interests focus on livestock health and disease in the UK and in developing countries. She was Vice-Chair of the Board of GALVmed, a public private partnership, funded by The Bill and Melinda Gates Foundation and DFID, focusing on supporting the development of biologicals and therapeutics for neglected diseases in developing countries. Julie sits on numerous scientific advisory bodies within Scotland, the UK and internationally. She is Vice Chair of the recently-formed Scottish Food Commission and is Chair of the UK Animal and Plant Health Partnership, helping to co-ordinate strategies to deal with infectious diseases threatening animals and plants throughout the UK. Julie was recognized for her contribution to animal medicine and research through the award of an OBE in 2014.

Dynamic Earth, James Hutton and Scotland's Inspirational Landscape



Dr Hermione Cockburn
Scientific Director
Dynamic Earth Enterprises Ltd

In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 27th February 2017.

Edinburgh is home to Dynamic Earth - the UK's only science centre dedicated to telling the story of our planet and rightly so, given that it was here at the end of the 18th Century that James Hutton laid the foundation for modern geology. In this talk Hermione Cockburn will explain the significance of the Scottish landscape to our understanding of Earth and how it continues to inspire people to take an interest in the future of our planet.

Dr Hermione Cockburn is the Scientific Director at Dynamic Earth and has a range of experience in science communication as well as academic expertise in earth and environmental science. Her PhD is in geomorphology from the University of Edinburgh and she has researched landscapes in Australia, Africa and Antarctica. In 2002 she began presenting science radio and television programmes for the BBC. Highlights include Coast, Rough Science and Fossil Detectives. She taught Environmental Science for the Open University for ten years and is passionate about inspiring anyone who will listen with stories about the Earth.

What can Shaw, Wilde, Churchill, Bush and Pasteur teach us about innovation?



Professor R P Tooze FRSC FRSE

**Managing Director
Sasol Technology (UK) Ltd**

**In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 27th March 2017.**

The topic of innovation continues to exercise the public and private sector alike. Recent economic and political changes will only serve to heighten this debate. Whilst it seems incontrovertible that the translation of knowledge for the benefit of society is a laudable goal, there seems to be little consensus on how best to achieve this or even what constitutes innovation. Innovation can occur in all sectors, but success may depend on these acting in concert.

Using a thirty year career in the chemical industry as a reference I will attempt to highlight some common problems and pitfalls that bedevil the theory and practise of innovation and advocate an alternative model for productive innovation involving two key stakeholders, industry and academia.

Following a PhD in Chemistry from Imperial College London under the supervision of Nobel Laureate, Professor Sir Geoffrey Wilkinson Bob joined ICI and has subsequently worked in the chemical industry for over 30 years. This career has spanned various businesses and locations but always in R&D. He joined Sasol Technology UK in 2002 and was made Managing Director in 2004. He is currently Chair of Chemical Sciences Scotland, sits on the Scottish Industrial Biotechnology Development Group, the Energy Technology Partnership Advisory Group and served on the Scottish Science Advisory Council. He has wide experience of collaborative research having chaired the Industrial Board of a network of 40 of the leading Catalysis Laboratories in Europe and also currently chairs the Industrial Advisory Panel of the UK Catalysis Hub. Bob holds an honorary Professorship in Chemistry at the University of St Andrews giving lecture courses in the field of catalysis. He is a Fellow of the Royal Society of Chemistry and was elected as a Fellow of the Royal Society of Edinburgh in 2013.

Listening to Einstein's Universe: the hunt for gravitational waves

Professor Martin A. Hendry

MBE FRSE FInstP FRAS

**Professor of Gravitational Astrophysics and Cosmology
University of Glasgow**



**In the Augustine United Church
41 George IV Bridge
Edinburgh, EH1 1EL
On Monday 24th April 2017.**

On September 14th 2015 two giant laser interferometers known as LIGO, the most sensitive scientific instruments ever built, detected gravitational waves from the merger of a pair of massive black holes more than a billion light years from the Earth. LIGO estimated that the peak gravitational wave power radiated during the final moments of this merger was more than ten times greater than the combined light power from all the stars and galaxies in the observable Universe.

Join Professor Martin Hendry as he recounts the inside story of this remarkable discovery - hailed by many as the scientific breakthrough of the century. Learn about the amazing technology behind the LIGO detectors, which can measure the signatures of spacetime ripples less than a million millionth the width of a human hair, and explore the exciting future that lies ahead for gravitational-wave astronomy as we open an entirely new window on the Universe.

Martin Hendry is Professor of Gravitational Astrophysics and Cosmology at the University of Glasgow, where he is currently head of the School of Physics and Astronomy.

He is a member of the LIGO Scientific Collaboration - an international group of more than 900 scientists who, with their colleagues in the Virgo Collaboration, in February 2016 reported the historic discovery of gravitational waves.

Annual General Meeting

The Society's AGM will be held in the Augustine United Church,
41 George IV Bridge,
Edinburgh, EH1 1EL,
at 7pm on Monday 5th June 2017.

(Please note that this is not the last Monday of the month)

The President, Professor Stuart Monro, will be in the Chair.

Agenda ¹

1. Apologies for Absence
2. Minutes of the AGM held on Monday 6th June 2016
3. President's Report
4. Presentation of the Annual Report & Accounts for the year ended 30th September 2016
5. Election of office-bearers
6. Any other competent business

Only Fellows of the Society may attend and be present at this part of the evening's proceedings.

Members' Evening

On the conclusion of the AGM, by 7.30pm, visitors and guests will be invited to join us for the Society's Annual Members' Evening. There will be a short talk (details to be confirmed later) followed by a reception where wine, soft drinks and nibbles will be served. All are invited to take up this opportunity to meet and mingle with Fellows and guests.

¹ The Agenda for the AGM is subject to change.

The Engineering Science Prize (formerly the Technological Studies Prize) and Bronze Medal

The Society has presented awards and medals since its earliest days. More recently it has instituted a prize of a medal and a book token for the best student in the SCE Higher examination that the Council believe most closely matches the objects of the Society. From 2012 this was the examination in Technological Studies and from 2016 the Engineering Science syllabus. The presentation is made at the *Science and the Parliament* at which similar awards are made from the Royal Society of Chemistry, the Institute of Physics, and the Society of Biology, which takes place annually in November at Our Dynamic Earth.

Prizewinners

Technological Studies Prize

2012	Euan Walker	Marr College, Troon
2013	Catriona Sinclair	George Watson's College
2014	Suzie Neave	George Watson's College
2015	Michael Hain	Hutchesons' Grammar School

Engineering Science Prize

2016	Scott Bennie	Bishopbriggs Academy
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President

Professor Stuart Monro OBE DUniv FRSE
president@rssa.org.uk

Vice-Presidents

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Dr Beverly Bergman MB ChB PhD FFPH FSAScot

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